Conference Paper

Socio-Biological Risk Factors for ADHD

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Abstract

The aim of this article was to show the relationships of socio-biological factors in the development of the child with ADHD with the degree of severity of the defect. As we tend to assume, both social and biological factors (together or separately) are not selective for the development of certain cognitive functions (for example, the early debut of the disease for the non-formation of control functions or pregnancy complications for the non-formation of auditory memory), and globally, in aggregate, influence the mental development of the child. The study allowed us to establish risk factors in which we can talk about the possibility of developing and aggravating ADHD, identify opportunities for its prevention and confirm the importance of early complex neuropsychological remediation in the treatment of the disease.

Keywords: ADHD, socio-biological characteristics of the development, ADHD risk factors.

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1. Introduction

Despite the fact that attention deficit hyperactivity disorder is a big social problem and uses for the study and remediation the forces of many specialists, the nature of ADHD remains insufficiently studied. Having a large amount of data about the causes of ADHD, there are no studies where you could find data about the relationship of ADHD syndrome in the aspect of socio-biological features of development of the child during pregnancy, birth and the early development up to the year. This was the purpose of our research.

According to Russian and worldwide studies, two groups of factors influence the development of attention deficit hyperactivity disorder in a child:

- biological factors, among which stand out: genetic predisposition [1, 2], peculiarities of neurobiological (neurotransmitter) regulation of brain activity [3], neuroanatomic deviations in brain development [4, 5], deviations of the functional brain conditions [6]. There are many hypotheses (genetic, neurobiological, neuroanatomical, biochemical, toxic, etc.) of the occurrence of ADHD.

- social situation of child development, including global changes and trends in the information society (general change of speech culture to visual [7]; requirements imposed by society to the child; cultural traditions of society; traditions of education; traditions and type of relationships in the family [8–10].

There is no consensus in the world literature devoted to the analysis of ADHD in priority, combination and interaction of biological and social factors in the etiology of ADHD. Socio-psychological factors, including intra-family and out-family, certainly play an important role in the formation of attention deficit hyperactivity disorder. But we suppose that adverse psychosocial conditions are not an independent cause of the formation of ADHD, but only provoke the further development of the disease, to which the child has a biological predisposition.

2. Methodology

To solve the problem posted in this work there were diagnosed 38 children with ADHD diagnosis confirmed neurologically and on the Conners' scale data. The study involved 17 preschool children (4 girls and 13 boys) at the age from 3 to 7 years and 21 schoolchildren (3 girls and 18 boys) at the age from 8 to 11 years, using Lurian and western psychometric methods. Important information about the child gives a questionnaire filled by parents who comes to a neuropsychologist (family composition, features of the pre-, peri- and postnatal development of the child, his problems in the family and the children's collective, injuries and chronic diseases, etc.).

In our work for solving the problem of identifying biological factors of ADHD development, we quantified the frequency of occurrence of pre -, peri - and postnatal abnormalities in children with ADHD. The summary data are presented in Table 1.

In addition, we were looking at the factor of lateralization of mental functions. Among all amount of children 69% were right-handed, 17%-left - handed and 14% -ambidextrous.

For our research we used the following methods:

- *Conners scale* - was created to assess the presence and severity of attention deficit hyperactivity disorder [11]. Conners Scale to determine the level of ADHD - questionnaire containing 10 (short variant) or 80 (full version) questions, which assesses behavior of the child. In our study, parents of preschoolers were proposed short version of the questionnaire, while parents of primary school students filled out the full version.

Table 1: Frequency of occurrence of pre -, peri - and postnatal deviations in children with ADHD.

	Revealed in the anamnesis (%)	Not identified in anamnesis (%)
Pathology of pregnancy	77	23
Pathology of childbirth	76	24
Neurological status up to a year	73	27
Abnormal motor development up to a year	19	81
Motor development delay	58	42
Abnormal speech development	7	93
Delay in speech development	37	63
Marked somatic pathology	42	58
Brain injuries	23	77

- Methods of *Lurian neuropsychological examination*, adapted to the children population, with quantitative and qualitative evaluation of results. These methods allows us to differentiate difficulties in learning and behavior, due to an underdevelopment or individual peculiarities of functioning of brain structures [12, 13].

- The determination of the *lateral organization profile* with the M. Annette questionnaire and test "the clock", "the telescope» [14].

- *Analysis of the early development of the child* through a special questionnaire for parents [12]. The questionnaire gives information about the family structure, the features of peri-, pre-and postnatal development of the child (how the pregnancy, childbirth and first year child's life proceeded), lateralization of mental functions, as well as problems in the family and children's group, injuries and chronic diseases, etc.

3. Results

Using the meta-analysis, we conducted a correlation analysis on the Spearman criterion to identify the relationships between neuropsychological indicators of mental functioning in ADHD and socio-demographic parameters (age, gender), the type of hemispheric differentiation of functions, as well as biological and social characteristics of pre-, peri - and postnatal development of the child. Consider the impact of each of these factors separately.

3.1. Age

It was found that the older the child, the lower the penalty score on praxis scales and memory before correction, indicating partial compensation with the age of the difficulties. It was estimated that with age the penalty score for gnosis after correction is higher, and we can talk about the stability of gnostic defects in ADHD and the importance of starting the remediation at an earlier age. It is also found that the older the child, the higher the penalty for neurodynamic parameters and the higher the percentage of defects after correction.

3.2. Gender differences

Our study revealed that boys' representation of praxis defects after correction is significantly higher compared to girls.

3.3. The lateralization of mental functions

The study of the influence of lateralization of mental functions meets the modern trends of neuropsychological research and is used in a very large number of modern research both in Russia and abroad in the study of factors affecting the formation and structure of the studied phenomena.

According to our research, left-handed children had higher penalty points in praxis, memory, intelligence, and a total neuropsychological penalty after a course of remediation. Also in our work it was found that penalty point of left-handed children for neurodynamics scale is higher before the remediation course and higher representation of defects of general characteristics before and after remediation.

Thus, the obtained data may indicate more stability of defects (less effective of remediation) in the left-handed children compared to the right-handed.

3.4. Birth pathology

In our study it was established that than more marked birth pathology according Apgar scale (the entanglement of the umbilical cord, asphyxia, hypoxia, hypotrophy, prematurity and other disturbances), than higher representation of defects of praxis after the remediation.

3.5. Neurological symptoms up to one year

The obtained data show that than more marked neurological symptoms (motor anxiety, hyper/hypotension, convulsions with fever, redness with crying, functional immaturity of the gastrointestinal tract, etc.) are up to a year, than more higher representation of gnosis defects before remediation we can observe.

3.6. Delay of motor development

The results of the study revealed that than stronger the child's delay in motor development (for example, the late the child began to hold the head, sit, walk, etc.), than higher the penalty points are noted in the areas of gnosis and general characteristics before remediation. After one remediation course these children had a higher number of penalty points - on the scale of praxis, memory, intelligence, and higher the representation of defects in the spheres of praxis, gnosis and intellect. These results we refer to the intermediate, because these children need, as a rule, not one remediation course.

3.7. Delay in speech development

It was found that these disturbances lead to serious consequences. Before the remediation, these children have higher penalty points on the scales of general characteristics, praxis, gnosis, memory, speech, intelligence, and, importantly, on the scale of the total neuropsychological score. After remediation - on scales praxis, speech, intelligence, and also the total neuropsychological score, more defects are found in the spheres of gnosis and praxis. Underdevelopment of speech leads to a delay in the functioning of almost all mental functions, and combination of difficulties makes it difficult for the compensation of defects. Therefore, in this case we are talking about an intermediate result in long-term work with such children.

3.8. Brain injuries

According to our data, the presence of head injuries with symptoms of concussion in the anamnesis of the child correlates with a number of indicators. These children have higher penalty points in the areas of praxis, memory, intelligence and, most importantly, on the scale of «total neuropsychological penalty point» before the start

of remediation, which reflect the degree of delay in mental development in children with ADHD.

4. Conclusions

In the analysis of biological factors, interesting data were obtained in the study of gender differences. It was found that boys compared with girls have higher representation of praxis defects after remediation. Despite the fact that the manifestations of hyperactivity and related problems do not depend on the sex of the child, in our study we note this difference. Apparently, girls being inherently more resistant learners and achieve better results after the remediation compared to boys.

Studying the differences connected with inter-hemispheric differentiation of mental functions, we obtained the following results. According to our research, the left-handed children had higher penalty points on praxis, memory, intelligence and total neuropsychological penalty points after a course of remediation. We also note that the penalty point of left-handed children on the scale of neurodynamics is worse before the course of remediation and higher representation of defects of general characteristics before and after remediation. The majority of studies of the specificity of the mental activity of the left-handed associated with the study of pathological phenomena. At the same time, it was established that they have much more often specific forms of dysontogenesis associated with insufficiency of speech, reading, writing, counting, optical-spatial, psychomotor functions, etc.[15–18] than the right-handed ones. Along with the lagging behind in a number of parameters of mental development left-handers discover a greater vocabulary, greater general awareness and erudition, higher achievements in mathematics. Among them there are many artistically and artistically gifted [19]. "The dominance of one of the hemispheres in humans, as a consequence, determines the direction of psyche in specific ways of perceiving and evaluating information from the environment" [20, p. 326]. Among left-handers suffering from ADHD participated in our study, we can see more emotionality, great sense of humor and creative approach to solving almost any problem. Thus, the data of our study indicate not to a lag in mental development in the left-handed compared with the right-handed, but to stronger stability of defects in their course of remediation.

In our study, it was established the relationship between the severity (Apgar scale) of birth pathology and the representation of child praxis defects after remediation.

Than more severe the pathology of childbirth, than more disturbances of motor coordination, unformed fine motor skills and praxis we can observed and than more difficult to solve these difficulties in the process of remediation.

Our study it was found that than more difficulties in the development of the child up to a year (motor anxiety, hyper/hypotension, convulsions with fever, redness with crying, functional immaturity of the gastrointestinal tract, etc.), than more unformed are gnostic functions before remediation (auditory, visual, visual and spatial perception). Likely, according to features of functioning of the child until year, "unclaimed" brain zones do not receive timely sensory information and, respectively, delay or lag in development [21], that leads to disturbances in one or another sphere, and in this case - in gnostic.

It is marked that delayed motor development up to a year have negative impact on the mental development of the child (for example, the child late began to hold the head, sit, walk, etc.). Such children have higher penalty points in the gnosis spheres and the general characteristics before the remediation. And after one remediation course these children have a higher number of penalty points - on the scales of praxis, memory, intelligence, and the representation of defects in the spheres of praxis, gnosis and intellect is higher too. These data are important for the dynamics and structure of remediation help to the child. Here we can talk, first, about the seriousness of deviations from the norm in the delay of motor development of the child up to one year and, second, about the specificities of remediation when these children need more than one cycle of remediation.

Similar data, but more marked, we received in the study of children with early speech development delay. As with the delay of motor development, these children have disturbances on a number of scales. Before remediation - on the scales of general characteristics, praxis, gnosis, memory, speech, intelligence, and, importantly, on the scale of the total neuropsychological score. After remediation - on scales praxis, speech, intelligence, and also the total neuropsychological score, more defects are found in the spheres of gnosis and praxis. This data is not accidental. After all, the delay of speech development leads to underdevelopment of almost all spheres of mental functioning of the child, and these data are described in the literature [15, 16].

Head craniocerebral injuries can disrupt brain activity at any age, but they are especially significant in the early years of the baby's life, when they may cause hyperactivity. Our study revealed how significant head injuries are for the development of higher mental functions. According to ouan higher the penalty points in the areas of praxis, memory, intelligence and, most importantly, the higher the total neuropsychological

penalty point before the start of remediation, reflecting the degree of mental retardation in children with ADHD. At the same time, social factors are also important: timely medical care, provision of bed rest, adequate examination, etc.

As we can see, these biological and social factors influence combined, that complicates their compensation. It also speaks about the necessity for long-term work with these children, taking into account intermediate data in remediation.

The study allowed us to identify risk factors in which we can talk about the possibility of developing and aggravating ADHD: gender differences, inter-hemispheric organization of functions, birth pathologies and neurological symptoms up to a year. The most negative impact is caused by delayed motor and speech development, as well as brain injuries. In these cases, the greatest number of combined symptoms was noted.

This study allowed to establish the main factors-predictors of the occurrence of the syndrome and to outline the possibilities of its prevention and to confirm the importance of early comprehensive neuropsychological remediation in the treatment of the disease.

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